AMA Mathematics and Calculus Teachers' Day 2018

AUT City Campus, 55 Wellesley Street East, Auckland, 1010

Tuesday 27 November 2018

The day is an opportunity to catch up with developments in Mathematics; to share resources and ideas; to listen to others; and to meet up with people old and new. Registrations will close on **Wednesday 21 November.**

Programme outline

Time	Event	Location
8:30 – 9:00 am	**Registration**	Foyer
9:00 – 9:05am	**Welcome:** Jiling Cao , Head of Mathematics, AUT	WG403 lecture theatre
9:05 – 10:00 am	**Plenary:** Dr. Igor' Kontorovich, University of Auckland	WG403 lecture theatre
10:00 - 10:25 am	**Morning tea**	WG402/407 lobby area
10:25 - 11:20 am	**Workshop 1**	*Various rooms in the WF Business building next door – see overleaf*
11:25 am - 12:20 pm	**Workshop 2**	
12:20 - 1:05 pm	**Lunch**	WG402/407 lobby area
1:05 - 2:00 pm	**Workshop 3**	*Various rooms in the WF Business building next door – see overleaf*
2:05 - 3:00pm	**Workshop 4**	

Plenary

Dr. Igor' Kontorovich, The University of Auckland

"Mathematics is human-made and then it's flawed" On the affordances of revealing the truth to our students

Mathematics has been often depicted as a perfect system that provides definite answers, all of which can be analytically developed and justified. My experiences from Russia, Israel, Canada, and NZ suggest that this picture is often shared by school students and promoted by their teachers, even though mathematicians are well aware that this is not (exactly) the case.

In this talk, I will share some colourful mathematical discrepancies and show that our beloved subject can be vague and self-contradictory, as it should be expected from any human activity. Then comes the questions of whether and how this human facet of mathematics could be exploited for learning and teaching purposes.

Igor' Kontorovich is a Senior Lecturer in the Department of Mathematics at the University of Auckland. Currently a Head of the Mathematics Education Unit, Igor' teaches mathematics and mathematics education at undergraduate and graduate levels, engages with school students and teachers, and conducts research in mathematics education. His research interests revolve around mathematical processes and ways of thinking as these are experienced by high-school and university students, teachers, and mathematicians. The talk is illustrative of Igor's research, which often results in practice-oriented ideas that challenge accepted norms and practices.

Registration information

Registration Form

Before proceeding to register please ensure that you have selected the workshops you wish to attend.

You will be asked to choose, in order of preference, three workshops in each of the four sessions.

We will do our best to give everyone at least 3 of their first 4 choices.

Confirmation of registration

Registration will be confirmed (by email) within two days of receipt, and at the latest by late Wednesday afternoon 21 November 2018.

Notice of late withdrawal

If, after registration, you cannot attend, you are welcome to send a replacement from your school. If you don't have a replacement please let us know because there could be a waiting list.

E-mail non-attendance to aklmathsassn@gmail.com.

Deadline for withdrawal and refund is 12 noon Friday 23 November 2018.

Cost

- AMA School Members $120 (incl. GST)
- AMA Personal Members $100 (incl. GST)
- Non-members $150 (incl. GST)
- Pre-service Teachers $120 (incl. GST)

Payment details

- Payment should be made to the Auckland Mathematical Association (GST Number 55-126-402) as soon as possible **after** registration is confirmed.
- Details of payment methods will be included in the information sent with confirmation of registration.

Contact for queries

Michael Walden
Phone: 09 846 2044 ext 8235
Email: mwalden@mags.school.nz

Workshop 1

1A **Getting you the PLD you need … introducing the new Networks of Expertise**
Marion Steel, President Auckland Maths Association
Robyn Headifen, Auckland Kaiarahi, Networks of Expertise

The MoE recognise that your colleagues are your best teachers. As a result they have launched the Networks of Expertise in association with subject associations across the country.

This session will give you an opportunity to have your say about what PLD you and your department need. This is your chance to help shape PLD in the Auckland region for the next few years.

1B **Maths Games**
Kerri Spooner – Auckland University of Technology

Games are a great way to reinforce skills, demonstrate concepts, generate engagement and build positive classroom cultures. Kerri will share more of her favourite maths games, accumulated after a long teaching career in the classroom. Come being prepared to participate.

This workshop follows on from a previous workshop Kerri facilitated at the last AMA Saturday morning. Attendance at the previous workshop is not necessary to participate. Open to all.

1C **Connecting Prime and Complex Numbers**
Qing Zhang – Mahurangi College

Prime numbers are those indivisible numbers that cannot be written as two smaller numbers multiplied together. They are the very atoms of arithmetic. Every number that is not a prime can be constructed by multiplying together these prime building blocks. Greek mathematician Euclid has proved that, unlike the finite atoms in Mendeleev's Periodic Table from which we can build all matter, there are infinitely many prime numbers. Generations of mathematicians had failed to see a pattern from the seemingly chaotic appearance of these numbers until the birth of complex numbers.

This presentation will look at the connection between prime and complex numbers and is open for any teachers who are interested in the history behind this topic.

1D **Blended-learning in a university mathematics course: exploring the impact of a small-scale change in an instructional model**
Tanya Evans & Julia Novak – The University of Auckland

Driven by the advances of emerging technologies, the higher education sector is forced to move with the times and look for ways to generate profit and become sustainable in a technological era. There is currently a great deal of buzz within higher education about the introduction of blended-learning, lecture recordings and flipped lectures. New technology is guiding the expectations of the students and questioning the need for and value of face-to-face lectures.

In this presentation, we will talk about a small-scale change in an instructional model for delivery of a university mathematics course at stage II which covers Calculus, Linear Algebra and Ordinary Differential Equations. As part of the project, a bank of multi-choice questions was developed and delivered via on-line quizzes preceding every lecture, each containing two short multi-choice questions. The implementation of this new resource not only provided instant feedback to students but also enabled teachers to access data prior to every lecture informing them about overall student learning of the material from the previous lecture and afforded opportunity to adjust their lecturing - content-wise and time spent on revision. The simplicity of our model is its characterizing feature: the core driver is the frequent pre-lecture assessment that contributes to the final grade for the course. As evidenced by our data, majority of students embraced this blended-learning mode of learning and that, in turn, led to increased attendance of live lectures and overall improvement in students' engagement with the learning practices.

1E **Throwing them off the success train and getting them to learn to drive themselves**
Sally van Praag – Albany Senior High School

This year I looked into Learner Agency which resulted in me entirely stopping talking at the front of my Level 3 Calc class. Instead the students have been researching online, reading actual books, watching videos, discussing heatedly, and basically attempting to drive their own learning forward rather than me spoon-feeding them to the end of the year as they usually hope I will. This is not an abdication model though, more a web of intentionality if you will, and if anything I feel more aware of and able to support each student and their strengths and weaknesses than ever before.

This approach came from a discussion with students around the need for them to learn to stand on their own two feet and that school might be a good place to learn some study skills and attributes they will need for University. It hasn't all gone smoothly and there has been a lot of learning on all sides but the good news is that they aren't further behind than the other classes and I have much more time to have meaningful conversations with students. In this workshop I will present my journey so far and the opportunity for you to challenge yourself to think about what would happen if you did less so that they could do more...

1F **Gamification**
Becky O'Gramm – Westlake Boys

So you've always been keen on games and activities in class, but you're ready to step it up a notch and turn a whole unit of work, a term or an entire course into a game? How about working through a Cluedo or SVU style unit of work to learn trigonometry or graphing, a SIMS setup to build a town through coordinate geometry, or turning the whole course into a virtual reality MMO environment (Classcraft)?

The latter is my weapon of choice and I'll take you through the basics to get started and give it a go, with some tips and tricks I've learned along the way. Students are given an avatar that is theirs for the year to develop and grow. I've seen a huge improvement in engagement with my students and even had requests for extra homework… The only prerequisite is that you like playing games and don't take yourself too seriously.

Workshop 2

2A **Alien vs Calculus**
Katy Thorne – Papamoa College

Inspired by a funky design task co-created with a colleague for Level 2 Graphing, Graphs met Aliens and the Graliens landed! A series of tasks followed in theme as the Level 2 and Level 3 students used calculus to rescue their Graliens and Gralien spacecraft designed in the first task from various predicaments.

This session is appropriate for those who teach Level 2 or Level 3 Calculus, have an interest in running a series of themed assessment tasks and a little bit about personalised learning on a small scale. And those who just like aliens.

2B **Transitioning from streamed maths to un-streamed maths classes**
Janet Williams & June David – Sancta Maria College

Sancta Maria is a Year 7 – 13 school that has embarked on the journey of teaching in a heterogeneous environment for the past two years. This session will present the process and management of the transition from a streamed to non-streamed environment for our school and the reasons for this being done. We will present the downsides and upsides- from a teacher's point of view. We will cover parent concerns, how we addressed them and show data comparisons of the Year 9 group of students who have learnt in both environments.

2C **Measurement in a new dimension**
Subash Chandar K – Ormiston Senior College

In this session, you will use free web-based online tools to create a 3D shape. How about programming your 3D shape? You will create a famous monument using basic block coding to build your monument in a 3D plane. Use the tools to create authentic tasks for your students and have a showcase with your students 3D printed models.

No 3D Printer - No problems! I will show you a program that will print a net of your image on a piece of paper. Join this session to see how you can teach measurement in a new dimension.

2D **Building towards a thinking classroom**
Tom Lin – Epsom Girls Grammar School

Can you entertain the idea that it's possible to teach WITHOUT speaking? Are you pulling your hair out because the students are reluctant to participate or lack 'critical thinking' skills?

The content of this workshop is inspired by Dr Peter Liljedahl's research, Sara Van Der Werf and other top maths teacher's work on boosting student's curiosity and improving student agency, and the way these ideas have transformed the way students learn in my classroom.

The workshop will cover WHY, WHAT and HOW you can take easy and small steps in creating your own mathematical thinking classroom.

2E **Investigative problem-solving in the mathematics classroom**
Michael Walden – Mt Albert Grammar School

In this workshop I will share some lesson ideas from my classes this year that were particularly enjoyable and helped in developing students investigative skills.

I will also demonstrate in depth how I have made use of activities on "Teacher Desmos" (including those developed by Kenneth Clarkson, Kristin School) in lessons to develop mathematics with students rather than delivering it to them

2F **Digital Resources in Action**
Ro Bairstow – King's College / BestMaths

Ro will discuss the impact that digital resources have had on learning and teaching in his secondary school mathematics classes at all levels. Student feedback and the effect on assessment will be shown.

He will demonstrate a range of resources, including eBooks, apps, websites and games that he has found useful, including some he has created himself (at www.bestmaths.net). These resources stimulate interest and help to increase understanding across many of the topics included in most upper primary and secondary curricula. Many of the resources are available on all platforms and all of the resources he will show are free.

Workshop 3

3A **Spiral Golden Ratio in Algebra and Calculus**
Amy Shen – Baradene College

As the famous actor Joseph Gordon-Levitt once said: "The spiral in a snail's shell is the same mathematically as the spiral in the Milky Way galaxy, and it's also the same mathematically as the spirals in our DNA. It's the same ratio that you'll find in very basic music that transcends cultures all over the world." It has been a privilege to be a mathematics teacher and be able to share with my students in the curiosity and excitement of exploring the sacred Golden Ratio. Learning is like a spiral, in the way that we keep returning to the lessons we thought we understood to discover even deeper truths. Ratios, fractions and decimals are familiar concepts for all college students, but the Golden ratio is unfamiliar to even senior mathematics students.

After running the workshops: "Power of e" and "Life of Pi" in the previous 2 years, Amy has been inspired to bring to you the Golden Ratio this year. We will look at mathematical features such as investigating different types of spirals and integrate these features into calculus scholarship questions. Amy will then share the Golden Ratio Phiacts worksheets that she designed for her year 12 calculus class and a couple of example questions that she selected for her senior students who attended her algebra intensive tutoring.

3B **Supporting students who struggle with Maths / Maths Anxiety in Year 9**
Margi Leech – Numicon

Maths Anxiety may not indicate maths inability. What is it? Is it imagined?
In this workshop will explore maths anxiety and the condition known as Dyscalculia.
We will explore how easy it is to support our students struggling with maths.

3C **The PIMP project: Pasifika Inspired Maths Problems**
Josephina Ah Sam & Sze Looi Chin – The University of Auckland

Māori and Pasifika students are underrepresented in tertiary level mathematics. In this project, our aim is to design and implement mathematical modelling activities inspired by Māori and Pasifika culture and traditions to examine the growth in mathematical and cultural awareness of students.

In this workshop, we will introduce a Pasifika-inspired mathematical task and discuss the responses of some Tertiary Foundation Course students.

3D **Start with a problem, not a method – Developing mathematical thinking from a problem**
Thorsten Scheiner – The University of Auckland

Mathematics textbooks and curricula often give the impression as if there is only one solution to a mathematical problem and that there is such thing as the best method in solving the problem.

This session explores ways to engage students in posing problems that foster divergent thinking and creativity in mathematics classrooms. Participants of this session will be involved in several activities of posing non-routine problems and reflections on promoting divergent thinking and creativity among students from Year 5 to 13.

3E **Escape Rooms**
Tyler Benson – Mt Roskill Grammar School

A worthy recipient of the Kalman Teacher Prize in 2018, Tyler will explain in this workshop how he uses innovative "digital escape rooms" in his lessons to maximise student engagement.

Escape rooms can be a fun way to engage student with thematic problems. To prove it, you will complete a small escape room of your own, followed by a guide on how to make one yourself.

You will leave with at least 2-3 digital escape rooms of my own, as well as a template to edit and change yourself.

Please bring a laptop or equivalent

3F **Extending our Scholarship students**
Michael Walden – Mt Albert Grammar School

In this workshop we will look at some of the problems our Scholarship students worked on this year.

I will share some particularly difficult problems and show how they (the students) were able to solve them in various different ways, strengthening their (and my own) understanding of the mathematics.

Bring a pen and paper and prepare to exercise your brain!

Workshop 4

4A **Desmos, Maths and Design**
Heather Ricketts – Auckland University of Technology

Desmos is an online graphing tool that many teachers and students are using, but few know its other potentials for design. This will be an interactive workshop that uses Desmos and simple online drawing software to create images that have mathematical properties. Come and explore how you can create images and manipulate them in Desmos using mathematical relationships. This provides the opportunity to build computational learning in a maths and design framework to delight your students.

4B **Is mathematical proof, childproof?**
Jo Knox – The University of Auckland

Mathematical proof is fundamental to the work of mathematicians and yet it is a process that has been marginalised in schools. In this session, I will outline reasons that may explain the absence of proof in classrooms. I will also discuss my current PhD research titled, "Is mathematical proof, childproof?" where I aim to develop tasks that support young students to engage in proving activity and develop valid reasoning.

4C **STEM Online NZ: Approaching calculus through gamification**
Andrea Lamb – STEM Online NZ – The University of Auckland

This session will introduce our Level 2 Calculus content, to be launched in 2019.
Our gamified introduction to calculus is a visual approach, aimed at developing an intuitive understanding of the basics of calculus. We will also preview our Level 1 Algebra content, to be launched term 1, 2019.

4D **3D Modelling and Printing**
Chadd Davis – Northcote College

This workshop looks into the development and implementation of a unit of work for measurement in Year 9, which uses free online CAD software to allow students to construct their own 3D models and explore all the measurements involved. Students also have an opportunity to extend their thinking through considering costing and design issues. This workshop will also give time to discuss viability of doing similar activities as assessment for NCEA Level 1 standards.

Participants are encouraged to bring their own laptops, so they may also use the software. And I will require connectivity to a projector.

4E **The ideas of Dan Meyer: 'Three-Act Math'**
Julia Crawford & Neil Marshall – Cognition Education

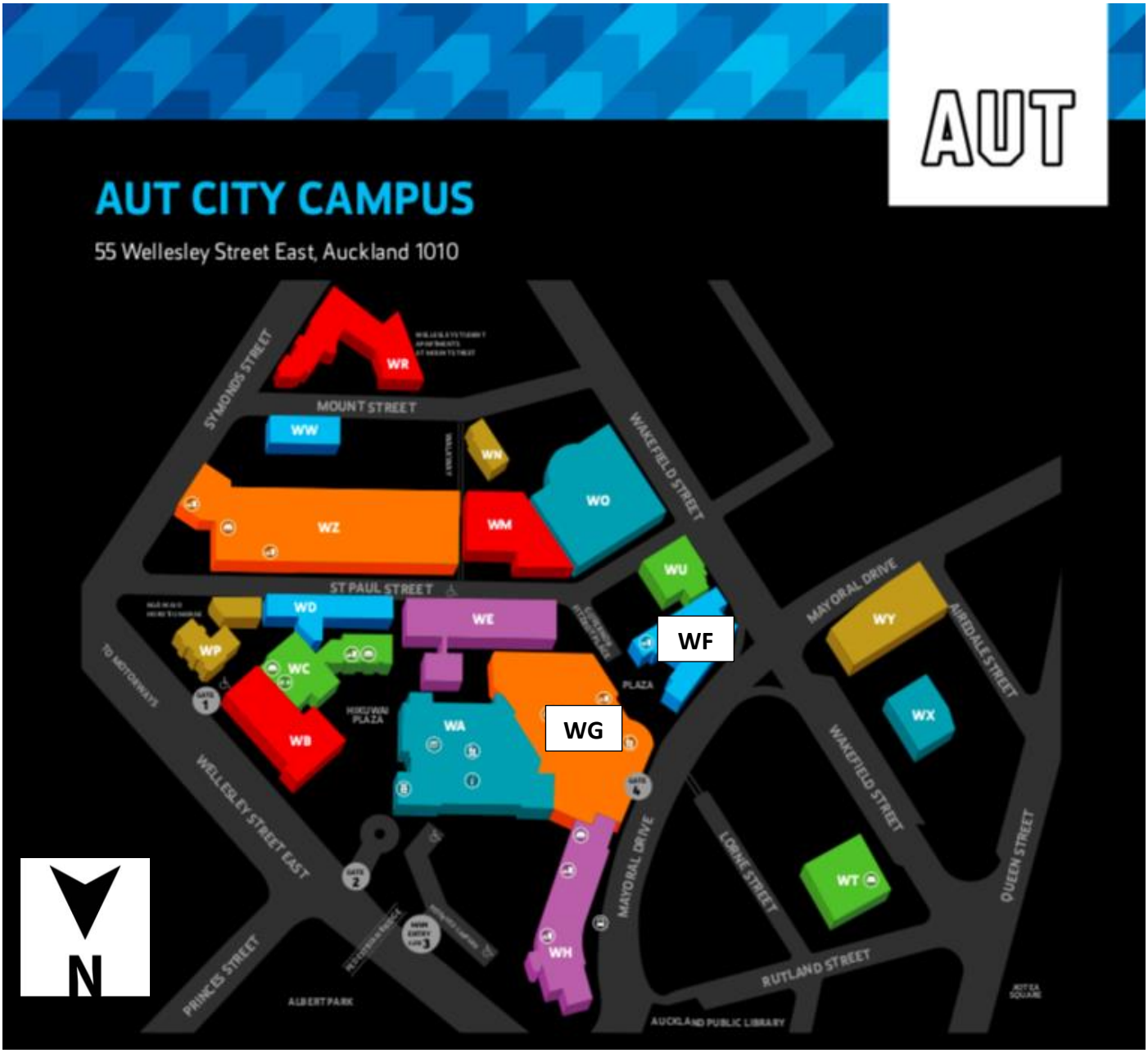
During this session we will explore the ideas behind Dan's lesson design, and explore the resource bank. We will also zoom into a couple of favourite tasks, relate them to the NZ curriculum, and discuss how to manage these tasks in a mixed ability classroom.

4F **Being creative with NCEA assessment material**
Miriam Robinson & Rachael Ouwejan – Albany Senior High School

At Albany Senior High School this year we have been exploring how we can combine NCEA internal assessments to create richer and more authentic experiences for the students. We have also developed some assess-when-ready options to better cater for the individual differences of students in our classrooms and in this workship we will explain the rationale for this change, the logistics involved and also the advantages of taking such an approach.

Join us to hear more about our successes (and challenges) when combining standards both within and beyond the maths department and to spend some time thinking and sharing ideas about other opportunities that you may have in your departments & schools.

Map of AUT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